

# Multimedia Systems

## Lecture – 2

*By*

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# Elements of Multimedia Data

- The common elements of multimedia includes
  - **Text:** All multimedia productions contain some amount of text. The text can have various types of fonts and sizes to suit the professional presentation of the multimedia software.
  - **Graphics:**
    - ❑ Graphics make the multimedia application attractive.
    - ❑ In many cases people do not like reading large amount of textual matter on the screen. Therefore, graphics are used more often than text to explain a concept, present background information etc.
    - ❑ There are two types of Graphics:
      - **Bitmap Images** : Bitmap images are real images that can be captured from devices such as digital cameras or scanners. Generally bitmap images are not editable. Bitmap images require a large amount of memory.
      - **Vector Graphics** : Vector graphics are drawn on the computer and only require a small amount of memory. These graphics are editable.

- Audio:

- ❑ A multimedia application may require the use of speech, music and sound effects. These are called audio or sound element of multimedia.
- ❑ Speech is also a perfect way for teaching. Audio are of analog and digital types. Analog audio or sound refers to the original sound signal.
- ❑ Computer stores the sound in digital form. Therefore, the sound used in multimedia application is digital audio.

- Video:

- ❑ The term video refers to the moving picture, accompanied by sound such as a picture in television.
- ❑ Video element of multimedia application gives a lot of information in small duration of time.
- ❑ Digital video is useful in multimedia application for showing real life objects.
- ❑ Video have highest performance demand on the computer memory and on the bandwidth if placed on the internet.
- ❑ Digital video files can be stored like any other files in the computer.

## ● Animation:

- ❑ Animation is a process of making a static graphical elements look like it is moving.
- ❑ An animation is just a continuous series of still graphical elements that are displayed in a sequence.
- ❑ The animation can be used effectively for attracting attention.
- ❑ Animation also makes a presentation light and attractive.

# Multimedia Data Representation:

## Text

- **Source:** Keyboard, speech input, optical character recognition, data stored on disk
- Stored and input character by character:
  - Storage of text is 1 byte per char / more bytes for Unicode.
  - For other forms of data (e.g. Spreadsheet les). May store format as text (with formatting) others may use binary encoding.
- **Format:** Raw text or formatted text e.g HTML, Rich Text Format (RTF), Word or a program language source (Java, Python, MATLAB etc.)
- Not temporal. But may have natural implied sequence e.g. HTML format sequence, Sequence of C program statements.
- Size Not significant w.r.t. other Multimedia data.

# Images

- **Input:** digitally scanned photographs/pictures or directly from a digital camera.
- May also be generated by programs "similar" to graphics or animation programs.
- Still pictures which (uncompressed) are represented as a bitmap (a grid of pixels organized as a 2D array).
- The two dimensions specify the width and height of the images. Each pixel has also a **bit depth** which represents the number of bits assigned to each pixel.
- Stored at 1 bit per pixel (Black and White), 8 Bits per pixel (Grey Scale, Colour Map) or 24 Bits per pixel (True Colour)
- **Size:** a 512x512 Gray scale image takes up 1/4 MB, a 512x512 24 bit image takes 3/4 MB with no compression.
- This overhead soon increases with image size.

# Graphics

- **Format**: constructed by the composition of primitive objects such as lines, polygons, circles, curves and arcs.
- **Input**: Graphics are usually generated by a graphics editor program (e.g. Illustrator) or automatically by a program (e.g. Postscript).
- Graphics are usually editable or revisable (unlike Images).
- **Graphics input devices**: keyboard (for text and cursor control), mouse, trackball or graphics tablet.
- **Graphics standards** : OpenGL, PHIGS, GKS
- Graphics files usually store the primitive assembly
- Do not take up a very high storage overhead.

# Audio

- Digital audio is characterized by a **sampling rate** in hertz, which gives the number of samples per second.
- A sample can be defined as an individual unit of audio information.
- Each sample also has a size, the sample size, which typically is anywhere from 8-bits to 16-bits depending on the application.
- CD Quality Audio requires 16-bit sampling at 44.1 KHz Even higher audiophile rates (e.g. 24-bit, 96 KHz)
- Audio signal is also described by dimensionality i.e. the dimensions of an audio signal signify the number of channels that are contained in the signal. These may be **mono (one channel)**, **stereo (two channels)**.
- 1 Minute of Mono CD quality (uncompressed) audio requires 5 MB.
- 1 Minute of Stereo CD quality (uncompressed) audio requires 10 MB.
- Usually compressed (E.g. MP3, AAC, Flac, Ogg Vorbis).



# Video

- **Input:** Analog Video is usually captured by a video camera and then digitized.
- Video is represented as a sequence of images. Each image in the sequence typically has the same properties of width, height, and pixel depth.
- There is one more temporal parameter known as frames per second or fps.
- Typically, videos have 25, 30 or 50 frames per second.
- E.g. A  $512 \times 512$  size monochrome video images take  $25 \times 0.25 = 6.25\text{MB}$  for a second to store uncompressed.
- Typical PAL digital video ( $720 \times 576$  pixels per colour frame)  $1.24 \times 25 = 31\text{MB}$  for a second to store uncompressed.
- High Definition video on Blu-ray (up to  $1920 \times 1080 = 2$  Megapixels per frame)  $6.2 \times 25 = 155\text{MB}$  for a second to store uncompressed. (There are higher possible frame rates!)
- Digital video clearly needs to be compressed for most times.